

(3 Hours)

[Total Marks: 80]

- N.B.** 1) Question No. 1 is compulsory  
2) Solve Any Three from remaining Five questions.  
3) Assume suitable data if necessary and state it clearly.

Q1 Answer any Four from the following

- a) Write a short note on HCCI Engine. **05**  
b) Give a brief account of Exhaust Oxygen Sensor **05**  
c) Briefly discuss the various efficiency and their significance associated with Engine **05**  
d) Compare Air Cooling System and Liquid Cooling System. **05**  
e) Explain why a rich mixture is required for Idling and sudden acceleration. **05**

- Q.2 a) State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses and differences in actual engine cycle and air standard cycle. Also draw actual cycle. **10**  
b) Explain the working of Transistorized Coil Ignition System with the help of neat Sketch and state its merits and Demerits. **10**

- Q.3 a) What are the essential properties of Lubricants? Explain with neat sketch Mist Lubrication System. **10**  
b) Calculate the diameter of fuel orifice of 4 stroke engine which develops 25 kW per cylinder at 2500 rpm. The specific fuel consumption is 0.3 kg/kW h and fuel is injected at a pressure of 150 bar over a crank travel of  $25^\circ$ . The pressure in the combustion chamber is 40 bar. Coefficient of velocity is 0.875 and specific gravity is 0.8762. **10**

TURN OVER

- Q.4 a) A 4 stroke diesel engine working at sea level (pressure = 1 bar and temperature 17°C) develops a brake power of 280 kW with a volumetric efficiency of 80% at sea level condition. Engine works at an Air-Fuel ratio of 18.1, with specific fuel consumption of 0.240 kg/kW h. The engine runs at 1800rpm. Determine the engine capacity and the bmep. The Engine is taken to an altitude of 3 km where the ambient pressure and temperature are -23°C and 0.715 bar. A mechanically coupled supercharger is fitted which consumes 12% of the total power developed. The temperature of air leaving the supercharger is 37°C. Determine degree of supercharging required to maintain the same brake power of sea level. **12**
- b) Describe the CRDI System with neat sketch and state its advantages and disadvantages **08**
- Q.5 a) A test on a single-cylinder, 4 stroke oil engine having a bore of 15 cm and stroke 30 cm gave the following results: speed 300 rpm; brake torque 200 Nm; Indicated mean effective pressure 7 bar; fuel consumption 2.4 kg/h; cooling water flow 5 kg/min; cooling water temperature rise 35°C; air-fuel ratio 22; exhaust gas temperature 410°C; barometer pressure 1 bar; room temperature 20°C. The fuel has a calorific value of 42 MJ/kg and contains 15% by weight of hydrogen. Take latent heat of vaporization as 2250 kJ/kg. Determine the Indicated thermal efficiency and volumetric efficiency based on atmospheric conditions. **12**
- Also draw up a heat balance sheet in terms of kJ/min. Take  $C_p$  for dry exhaust gas as 1 kJ/kg-k and superheated steam  $C_p = 2.1$  kJ/kg-k;  $R = 0.287$  kJ/kg K
- b) Describe in detail the various stages of combustion in SI Engine **08**
- Q.6 a) What is compensation and why it is done in Carburetor **05**
- b) Write a note on ratings of fuel for IC Engine **05**
- c) With a help of neat sketch explain Catalytic convertor **05**
- d) Explain the working of Thermostatic Cooling system **05**